

AMATEUR SATELLITE REPORT

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First HT-to-HT QSO Scored Thru OSCAR 10

An important milestone was reached May 28th when amateurs in West Virginia and California apparently became the first ever to QSO using handheld transceivers (HT) through an amateur radio satellite. KB6DDQ in Los Angeles and KD8GL in Wheeling, WV, each using only a 2-m FM HT first established contact at 1458 UTC. The historic event was facilitated by so-called "gateway" stations which served to connect local terrestrial repeater systems to the high-flying AMSAT-OSCAR 10 (AO-10) satellite. Although in the past cw QSOs have been reported where one of the stations keyed the transmit switch of his HT for a crude key, it is believed the May 28th QSO comprised the first occasion on which both QSO participants used HTs.

In West Virginia, KD8GL used his 2-m HT to talk through the Triple States Radio Amateur Club repeater, KD8GL/R. Signals from the repeater were picked up by the local gateway station WB8ZTV which converted them from FM to SSB while converting them to the 436 MHz OSCAR 10 uplink frequency. Signals were then beamed by WB8ZTV to OSCAR 10 positioned high over the Western Hemisphere.

Meanwhile in L.A., gateway station N6JFD tuned to the AO-10 downlink and converted the SSB back to FM and forwarded the signals to the WA6OBT repeater to which KD6DDQ was tuned. The reverse path to Wheeling was the mirror image of this path. Both repeaters and gateway stations operated full duplex and the QSOs were two-way. Signals in both directions were excellent according to monitors.

Later, the W7LWE repeater/gateway in Lake Havasu City, AZ joined in the fun. This made it the first three-way gateway operation and effectively linked amateurs in three states using OSCAR 10's trunking capabilities.

According to an AMSAT official, "This historic event marks the vanguard of easy-access satellite communications for utility use by minimally equipped amateurs."

Participating in the May 28th linkups also were KR3V, K8AN, K2QWD, N6IAW, W7MCF and numerous others.

Further dramatizing the significance of gateway operations, an event on the preceding day, May 27, vividly showed another aspect of the new, long duration coverage

OSCAR; endurance. On May 27th the Wheeling gateway was linked to expert satellite station ZL1AOX in Christchurch, New Zealand for three hours continuously.

AMSAT is suggesting that demonstrations of satellite communications by using gateway interconnects may be just the vehicle to exhibit the new OSCAR 10 capabilities while reducing new-user costs to zero. According to AMSAT's WA2LQQ, "Nothing can beat the flexibility of your own OSCAR station, but for those just starting out, this seems a good way to taste the wine before one buys the bottle!"

A free information kit is available from AMSAT (for an SASE) at P.O. Box 27, Dept GW, Washington, DC 20044.



The AO-10 array of KL7NO. Shown are two-meter and 70-cm linear Yagis and a pair of 24-cm loop Yagis. (KL7NO photo.)

Advanced Telecom Equipment Proposed for WØORE

Additional aspects of the ambitious WØORE Ham-In-Space proposal by ARRL/AMSAT have been revealed. Speaking on Westlink, ARRL's Public Affairs Manager Pete O'Dell, KB1N, says the Mission 51F proposal is based on the success of W5LFL but adds significantly to that base as well.

In addition to the two meter FM voice transmissions, the proposal calls for a 10 meter downlink. The modulation of the ten meter transmitter could be from any one of several sources. Perhaps most exciting is the prospect of amateur slow scan television (SSTV). If accepted, the standard format SSTV would use a "frame grabber" store and forward concept fed by NASA fast scan video sourced on the shuttle.

Another possibility for signal source is a 2 meter to 10 meter scanning channelized repeater. A 2 meter scanning receiver with calibrated dwell time would retransmit the uplink audio in a selected 10 meter downlink. The repeater would use FM inputs and outputs.

The 10 meter signal originated at the shuttle's altitude may introduce some interesting propagation research opportunities for amateurs the proposal points out. Thus beacon operation at 10 meters is also proposed.

AMSAT's inputs to the 51-F proposal were coordinated by Bill Tynan, W3XO. The mission is presently slated for a March 1985 liftoff.

The proposal's ambitious new aspects are complemented by WØORE's operating plan which, ASR has learned, includes plans for more scheduled QSO's with schools and amateur radio affiliated organizations. Word at ARRL and AMSAT HQ was that hopes were high that the proposal would be accepted by NASA. Cautious optimism was voiced by W3XO, KB1N as well as Roy Neal, K6DUE and the pioneer Ham-In-Space, Owen Garriott, W5LFL in recent interviews with ASR.

AO-10 Hints At Potential Research Topic

Not much has been said since launch of AO-10 regarding the potential for using it as a research probe into various propagation phenomenon. However, several interesting possibilities are suggested by recent dialog between ASR and various active AO-10 users.

An interesting phenomenon has been observed by a number of observers including NØAN, WØRPK and WA2LQQ. EME (moon bouncers) have noted and often seek to advantage themselves of the signal enhancement occurring when the moon is a degree or two above the horizon. The resultant ground effect can add several dB to the echo amplitude. A similar effect has been observed with AO-10 when the spacecraft is close to apogee and just at the observer's horizon. Enhancement of several dB has been reported. Downlink signals can appear surprisingly potent in this circumstance.

Also at these special times a different and very pronounced effect can be noticed. Apparently due to the mutual interference of direct and earth-reflected rays, interference rings are established. The observer hears these as deep fades

with highly regular periodicity between 7 and 8 seconds. The fades can be 15 dB or more deep. Polarization changes are noted between AOS and the spacecraft's rise to about 5 degrees above horizon also.

The effects observed, it is reported, seem most noticeable around apogee since the off-boresight angle between the observer and the spacecraft are lowest for the required on-horizon condition when the spacecraft is at apogee. Minimizing boresight error concurrently minimizes spin modulation especially on Mode B. There is every reason to believe the observed diffraction rings will be heard (with anticipated different periodicity) on Mode L but there have been no reports to ASR of this to date.

A second experimental propagation mode involves ducting or so-called Tropo. With the warm summer months at hand in the Northern Hemisphere the scene is set for some interesting times listening sub-horizon for AO-10 via ducts.

The several meteor showers offer yet another interesting avenue for research using AO-10 as a probe.

AMSAT and ASR encourage amateurs and serious students alike to advantage themselves of the enormous opportunity at hand to employ AO-10 as a priceless, accessible tool for probing propagation from the troposphere up to the magnetosphere. Reports and articles are welcome and solicited by AMSAT.

Technical Achievement Award Kicks Off Soon

AMSAT has named Dave Olean, K1WHS, to head up its Technical Achievement Award program. The object of the program is to promote and recognize superior skill in engineering, assembling and testing an amateur radio station especially in the amateur satellite service.

Dave is an experienced VHF operator of note and has himself engineered one of the most sensitive amateur radio stations in the world. His massive 2 meter EME array was featured on the cover of QST and has been measured at 26 dBd gain.

An award will be made to each participating amateur who can demonstrate his station meets certain minimum receive sensitivity requirements, Dave explained. On-the-air transmissions will present precisely calibrated amplitude signals. Numerical code groups will be sent by cw. If one successfully copies the cw, one qualifies for the award. The amplitude of the transmissions will then be reduced incrementally with code groups sent at each level. Endorsements to the basic award will be made for each successive lower level copied. Tests will be run on both Mode B and Mode L. Tests will normally be scheduled around apogee to equalize path losses for participants. Initial plans call for 4 tests per year according to Project Manager K1WHS.

Provision of a standard reference amplitude signal, a frame of reference for all to measure up to, coupled with a tangible reward for upgrading station performance is viewed as a positive step towards improving the performance of the general user community. It will go a long way to reducing demands on the transponder since, presumably, with better "ears" users will find less need to use higher

transmit power levels. There may also be a future tie-in of this program with operating awards so that bonus points in an operating event may be garnered by a station which had previously earned a specific endorsement to his Technical Achievement Award.

First test run of this program is anticipated mid-to-late summer according to K1WHS. Stay tuned.

Short Bursts

- Several changes are afoot in the Net Control Station area. After many years of selfless service, W6CG is retiring from NCS duty. Bud founded and has been the mainstay of the Southwest Pacific AMSAT Information Net which is held each Saturday at 2200 UTC on either 28878 kHz or 21280 kHz. Bud cites his health as the cause of his retirement. Bud's long history of service to AMSAT is capsulized in ASR #20, November 16, 1981.

Also retiring from NCS duty is N3AR. Ron cites business and personal reasons for retiring. Ron also spearheaded the C64 program development effort which brought the W3IW1 orbit program to Commodore users.

W8GQW is actively seeking replacements for these two fine NCS. See ASR #78.

- In related news, Operations Vice President KO5I has announced the appointment of Butch Mason, W6KAG, as Voice Bulletin Special Service Channel coordinator. Butch and W6CG have been formulating and transmitting the voice bulletins on AO-10 SSC H2, 145.962 MHz.

- JR1SWB reports JAS-1 is progressing very well but that there may be some delay in the launch. Sound familiar?

- Jan King's, Phase IV "Starbursts" concept continues to provoke enthusiastic discussion. A key test will come later this month when technical experts from several AMSAT affiliated organizations meet in England to discuss future projects.

- Gateway operations may require redefinition of the Phase III bandplan. (See related story herein.) Inputs regarding which segment of the band (top, middle, lower downlink) should be used are invited. Please advise HQ on this.

- A proposal to realign Mode B and Mode L operating times has surfaced. The proposal, if adopted, would change Mode L operating times from the present 8 hours per week (2 hours per apogee every Wednesday and Saturday) to 8 hours per week (1 hour per apogee on each Monday, Wednesday, Friday and Saturday). In each case the operating window would be centered on apogee. Intent is to spread Mode L operating time across the week better. Comments to HQ are invited.

- UO-11 telemetry analysis next time as space allows.

Sister Cities Gateway Program Starts

ASR solicits entries for a list of operational or soon to-be-operational gateway stations worldwide. The list will be published periodically to inform gateway operators what other stations are favorably disposed. List inputs should contain callsign and QTH of the gateway station, the primary

terrestrial (local) coverage area; name, address, callsign and telephone number of the gateway station; other relevant information (such as repeater operating frequencies, etc.)

Extremely helpful also would be a tentative operating schedule. For example, "1500 to 2200 UTC Sundays whenever AO-10 is in view of Tulsa, OK." The published list will comprise a forum for gateways who wish to schedule a special event linkup for their coverage areas by matching in the so-called "Sister Cities Gateway Program." Using the "Sister Cities Gateways Program" sponsors in London, England might match up their coverage area with that of London, Ontario or even Lake Havasu City to check on the welfare of the (former) London Bridge!

Send gateway info to: ASR, P.O. Box 177, Warwick, NY 10990.

Suspect Low Temps Affect UO-11 Command-Ability

With nearly a month of data accumulating since the return of the UO-11 beacons on 14 May, suspicions have focused on the temperature of the command decoder module as being the cause of the problem which silenced the beacons shortly after launch.

Progress is being made nevertheless with late reports from the University of Surrey, Guildford, England suggesting the spin is being analyzed and attempts to deploy the gravity boom may occur later this month.

An earlier report appeared on the UO-9 bulletin board. The following is an extract of that bulletin concerning UO-11.

The most likely cause of the last 10 weeks silence is indicated by the very poor command uplinks. Indeed, only 8 commands were loaded into the spacecraft in the first 2 days after recovery. This accompanies a decrease in command decoder and battery temperatures, which is cyclic between -5c and -12c with a period of about 10 days. Commands are received — albeit infrequently — over only about 3-4 days of this cycle, explaining why the current investigations are proceeding cautiously. Since temperature fluctuations are connected intimately with sun-angle, and hence attitude, the command problems could be purely due to the spacecraft antennas pointing away from the earth during some parts of the precession cycle.

Further investigations are continuing with efforts to characterise the signals received by the spacecraft receivers, which are not performing as well as expected. In addition, experiments to improve the performance of the data decoders (which convert the audio signals received into digital data for use by the telecommand logic) are under way, concentrating on pre-distortion of the uplink waveforms.

Stephen Hodgart, our attitude control expert at Guildford, has been working on an elementary magnetorquing manoeuvre which can be controlled to improve the average sun angle (and hence the temperature), the antenna pointing (always towards the ground over the Northern Hemisphere), and hence the command success rate, given a minimum of ground interaction in the process. This will

be attempted on one of the next few 'warm' cycles, once all the possible side-effects have been evaluated.

****Oscar-11 Attitude — from Stephen Hodgart (UoS)****

The angular motion of UoSAT-2 has been estimated from the magnetometer data extracted from the pass over Guildford on orbit 1076.

This reveals a dominant transverse motion, a spin state approximating a 'flat spin' or 'tumbling', defined by a rotation of the z-axis about a spin axis in the plane of the x and y axes of the spacecraft. This arbitrary spin axis is the direction of the overall angular momentum vector and is parallel, within 1 or 2 degrees, to the plane of the orbit. The period is 42 seconds.

The motion is complicated by a slow z-spin oscillation with a period of 165 secs and an amplitude of ± 45 degrees. This oscillation couples to the dominant transverse motion causing the flat spin to modulate into a nutational cone of a wide half-angle varying between 84 and 96 degrees, in synchronism with the z-spin oscillation. Every half-cycle this cone flattens for an instant to the pure flat spin and then inverts.

Further analysis using other orbital data is required to test for possible precessional change in the angular momentum, also to test for any continuous advance in the z-axis rotation in addition to its angular oscillation.

Orbit Predictions By KA9Q

oscar-9:

Wed Jun 6 01:03:01.281 1984 UTC: Ascending node at 137.9 west
Nodal period: 94.43341 min
Longitude increment: 23.606356 deg w/orbit
Element set 644, epoch: Sun May 27 09:40:51.21 1984 UTC

oscar-11:

Wed Jun 6 00:40:39.634 1984 UTC: Ascending node at 44.5 west
Nodal period: 98.56213 min
Longitude increment: 24.639684 deg w/orbit
Element set 29, epoch: Sun May 27 02:29:07.761 1984 UTC

rs-5:

Wed Jun 6 01:56:48.300 1984 UTC: Ascending node at 134.6 west
Nodal period: 119.55415 min
Longitude increment: 30.015553 deg w/orbit
Element set 169, epoch: Sat May 26 02:55:39.224 1984 UTC

rs-6:

Wed Jun 6 00:39:17.68 1984 UTC: Ascending node at 123.2 west
Nodal period: 118.71513 min
Longitude increment: 29.805589 deg w/orbit
Element set 81, epoch: Wed May 23 10:11:16.361 1984 UTC

rs-7:

Wed Jun 6 00:33:40.787 1984 UTC: Ascending node at 117.2 west
Nodal period: 119.19447 min
Longitude increment: 29.925512 deg w/orbit
Element set 156, epoch: Sat May 19 11:24:26.127 1984 UTC

rs-8:

Wed Jun 6 01:56:24.178 1984 UTC: Ascending node at 132.5 west
Nodal period: 119.76282 min
Longitude increment: 30.067701 deg w/orbit
Element set 274, epoch: Thu May 24 06:32:55.695 1984 UTC

Satellite: oscar-10

Catalog number: 14129

Epoch time: 84146.88369060

Fri May 25 21:12:30.867 1984 UTC

Element set: 103

Inclination: 25.6202 deg

RA of node: 197.5898 deg

Eccentricity: 0.6089713

Arg of perigee: 274.5131 deg

Mean anomaly: 22.7147 deg

Mean motion: 2.05044694 rev/day

Decay rate: 1.21e-06 rev/day^2

Epoch rev: 715

Semi major axis: 26106.549 km

Anom period: 699.556531 min

Apogee: 35630.517 km

Perigee: 3034.239 km

Beacon: 145.8100 mhz

Satellite: oscar-11

Catalog number: 14781

Epoch time: 84148.10356205

Sun May 27 02:29:07.761 1984 UTC

Element set: 29

Inclination: 98.2421 deg

RA of node: 210.3619 deg

Eccentricity: 0.0014072

Arg of perigee: 358.1468 deg

Mean anomaly: 1.9676 deg

Mean motion: 14.61867821 rev/day

Decay rate: 2.58e-06 rev/day^2

Epoch rev: 1262

Semi major axis: 7062.366 km

Anom period: 98.504118 min

Apogee: 694.181 km

Perigee: 674.305 km

Beacon: 145.8250 mhz